CLAIMS

What is claimed is:

1. A signal conditioning circuit for rectifying and amplifying an input signal, the circuit comprising:

an inverting circuit including an inverting amplifier, an input resistance and a feedback resistance circuit, the feedback resistance circuit including a plurality of first resistances selectively combinable to provide a plurality of gain levels, the inverting circuit inverting first portions of the input signal and amplifying the inverted first portions based upon a first selected gain level, and

a non-inverting circuit including a non-inverting amplifier, a feedback resistance and an input resistance circuit, the input resistance circuit including a plurality of second resistances selectively combinable to provide a plurality of gain levels, the non-inverting circuit passing second portions of the input signals and amplifying the second portions based upon a second selected gain level.

2. The circuit of claim 1, further comprising a plurality of solid state switching devices in the feedback resistance circuit and the input resistance circuit, and wherein the resistances of the feedback resistance circuit and the input resistance circuit are selectively combinable by changing conductive states of the switching devices.

3. The circuit of claim 2, further comprising a control circuit coupled to the solid state switching devices, the control circuit applying control signals to the switching devices to place the switching devices in desired conductive states for combination of the resistances of the feedback and input resistance circuits.

4. The circuit of claim 3, wherein the control circuit monitors an output signal derived from signals amplified by the inverting circuit and the non-inverting circuit, and generates the control signals based upon the output signal.

5. The circuit of claim 4, further comprising an analog-to-digital converter coupled to outputs of the inverting and non-inverting circuits for generating a digital signal based upon the outputs.

6. The circuit of claim 5, wherein the control circuit monitors the digital signal and applies the control signals to the switching devices to maintain the digital signal within a desired range.

7. The circuit of claim 1, wherein the input resistance of the inverting circuit is a fixed resistance.

8. The circuit of claim 1, wherein the feedback resistance of the non-inverting circuit is a fixed resistance.

9. The circuit of claim 1, wherein the feedback resistance circuit is configured to selectively place the plurality of first resistances in parallel with one another, and the input resistance circuit is configured to selectively place the plurality of second resistances in series with one another.

10. A signal conversion circuit for converting an alternating current input waveform to a desired signal, the circuit comprising:

an inverting amplifier configured to receive the input waveform and to rectify and amplify portions of the input waveform by a first gain, the inverting amplifier having an input resistance and a feedback resistance network, the feedback resistance network including a plurality of first resistances and first solid state switches, conductive states of the switches being selectable to place the first resistances in parallel with one another and thereby to select the first gain;

a non-inverting amplifier configured to receive the input waveform and to pass and amplify portions of the input waveform by a second gain, the non-inverting amplifier having a feedback resistance and an input resistance network, the input resistance network including a plurality of second resistances and second solid state switches, conductive states

of the switches being selectable to place the second resistances in series with one another and thereby to select the second gain;

a control circuit coupled to the first and second solid state switches, the control circuit applying control signals to the solid state switches to select their conductive states and thereby to select the first and second gains.

11. The circuit of claim 10, wherein the inverting and non-inverting amplifiers are each configured to produce at least three discrete gain levels by selection of the conductive states of the first and second solid state switches.

12. The circuit of claim 10, further comprising an analog-to-digital converter receiving output from the inverting and non-inverting amplifiers.

13. The circuit of claim 12, wherein the control circuit is coupled to the analog-to-digital converter, monitors digital signals produced by the converter and applies the control signals to the solid state switches based upon the digital signals.

14. The circuit of claim 13, wherein the control circuit controls the conductive states of the solid state switches to maintain the digital signals within a desired range.

15. The circuit of claim 10, wherein the input resistance of the inverting amplifier is a fixed resistance.

16. The circuit of claim 10, wherein the feedback resistance of the non-inverting amplifier is a fixed resistance.

17. A signal conversion circuit for converting an alternating current waveform to a digital value, the circuit comprising:

an inverting amplifier configured to receive the input waveform and to rectify and amplify portions of the input waveform by a first gain, the inverting amplifier having an input resistance and a feedback resistance network, the feedback resistance network

including a plurality of first resistances and first solid state switches, conductive states of the switches being selectable to place the first resistances in parallel with one another and thereby to select the first gain;

a non-inverting amplifier configured to receive the input waveform and to pass and amplify portions of the input waveform by a second gain, the non-inverting amplifier having a feedback resistance and an input resistance network, the input resistance network including a plurality of second resistances and second solid state switches, conductive states of the switches being selectable to place the second resistances in series with one another and thereby to select the second gain;

an analog-to-digital converter coupled to the inverting and non-inverting amplifiers for converting output from the amplifiers to a digital value; and

a control circuit coupled the analog-to-digital converter and to the first and second solid state switches, the control circuit applying control signals to the solid state switches to select their conductive states and thereby to select the first and second gains to maintain the digital value within a desired range.

18. The circuit of claim 17, wherein the inverting and non-inverting amplifiers are each configured to produce at least three discrete gain levels by selection of the conductive states of the first and second solid state switches.

19. The circuit of claim 17, wherein the input resistance of the inverting amplifier is a fixed resistance.

20. The circuit of claim 17, wherein the feedback resistance of the non-inverting amplifier is a fixed resistance.

21. A signal conditioning circuit for rectifying and amplifying an input signal, the circuit comprising:

an inverting circuit including an inverting amplifier, an input resistance, a feedback resistance circuit, and first and second diodes coupled to an output line, the input resistance and the feedback resistance circuit resistances defining a desired inverting circuit gain, the

first diode being coupled in a feedback loop around the inverting amplifier and the second diode being coupled between an output of the inverting amplifier and a common signal output; and

a non-inverting circuit including a non-inverting amplifier, a feedback resistance, an input resistance circuit, and third and fourth diodes, the feedback resistance and the input resistance circuit defining a desired non-inverting circuit gain, the third diode being coupled in a feedback loop around the inverting amplifier and the fourth diode being coupled between an output of the inverting amplifier and the common signal output;

whereby negative polarity portions of an input waveform are inverted by the inverting circuit, amplified by the inverting circuit gain and applied to the common signal output when no signal is output by the non-inverting circuit, and positive polarity portions of the input waveform are amplified by the non-inverting circuit gain and applied to the common signal output when no signal is output by the inverting circuit.

22. The circuit of claim 21, wherein the feedback resistance circuit of the inverting circuit includes a plurality of first resistances selectively combinable to provide a plurality of inverting gains, and wherein the input resistance circuit of the non-inverting circuit includes a plurality of second resistances selectively combinable to provide a plurality of non-inverting gains.

23. The circuit of claim 22, further comprising a plurality of solid state switching devices in the feedback resistance circuit and the input resistance circuit, and wherein the resistances of the feedback resistance circuit and the input resistance circuit are selectively combinable by changing conductive states of the switching devices.

24. The circuit of claim 23, further comprising a control circuit coupled to the solid state switching devices, the control circuit applying control signals to the switching devices to place the switching devices in desired conductive states for combination of the resistances of the feedback and input resistance circuits.

25. The circuit of claim 24, wherein the control circuit monitors an output signal derived from signals output on the common output, and generates the control signals based upon the output signal.

26. The circuit of claim 25, further comprising an analog-to-digital converter coupled to the common output for generating a digital signal based upon the output signals from the inverting and non-inverting circuits.

27. A method for rectifying and amplifying an alternating current waveform of variable amplitude, the method comprising the steps of:

applying the waveform to an inverting amplifier having a plurality of discrete gain levels defined by a plurality of first resistances selectively connectable in a feedback network to rectify and amplify negative portions of the waveform by a desired one of the discrete gain levels;

applying the waveform to a non-inverting amplifier having a plurality of discrete gain levels defined by a plurality of second resistances selectively connectable in an input network to amplify positive portions of the waveform by a desired one of the second discrete gain levels;

combining output of the inverting and non-inverting amplifiers to obtain an output waveform; and

monitoring a signal derived from the output waveform and selecting the first and second discrete gain levels based upon the signal.

28. The method of claim 27, wherein the first resistances are selectively connectable within the feedback network via solid state switches, and wherein the step of selecting the gain levels includes placing the solid state switches in desired conductive states to place the resistances electrically in parallel with one another.

29. The method of claim 27, wherein the second resistances are selectively connectable within the input network via solid state switches, and wherein the step of

selecting the gain levels includes placing the solid state switches in desired conductive states to place the resistances electrically in series with one another

30. The method of claim 27, wherein the signal monitored is a digital signal produced by an analog-to-digital converter based upon the output waveform.

31. The method of claim 30, wherein the first and second gain levels are selected to maintain the digital signal within a desired range.